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Discussions

Interactive comment on "The Global Network of Isotopes in Rivers (GNIR): integration of water isotopes in watershed observation and riverine research" *by* J. Halder et al.

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We thank the referee for the comments. Please find our answers below: General comment and comment 2: The GNIR groups were clustered by the timing of minimum δ18O values and latitude (see p. 4054L6-9). The sinusoidal function was applied after the clustering in order to evaluate correlation and periodicity within each group (see p. 4054L19-21). Snow cover, air temperature or atmospheric circulation was not analysed. We have later given the groups a classification title, which refers to the major process determining its seasonal isotopic variation (See p. 4057 L8-10, 14-15; p. 4058L3-6, 12-16). We agree the titles may be confusing, especially in the method section, and we delete the titles from the flow chart and Fig.3. We will evaluate the phase/angle cross plot as suggested.

Comment 3: We will evaluate the suggested function. We have not observed such a bimodal seasonality in any of the data series we evaluated.

Specific points:

P4048L6: deleted periodic

P4053L25: There are geographical regions like the USA and Central Europe where there is a dense coverage of long data series. Here, it is permissible to exclude data series, which show gaps or are relatively short and work with the best available datasets. In regions like South America, Asia, and Africa isotopic measurements are very rare and rivers may carry even no water in the dry season. Here it deems necessary to work with all available time series to perform a global assessment. We added "...geographical regions having poor spatial data coverage (South America, Africa, and Asia)."

P4054L4-19: See answer for general comment and comment 2.

P4054L12: The occurrence of minimum and maximum δ18O in relation to temperature is well understood for precipitation. We refer here to existing knowledge and publications and a general approach. Temperature data were not analysed.

P4054L19-23: We do not use the phase to cluster and subset the data, only the timing of minimum δ18O values and latitude (See also answer for general comment and comment 2.). The analysis of the amplitude confirms later that the different groups have also distinguished amplitudes.

P4054L25: By "seasonality" we refer to the variation of monthly means (1 to 12) at a GNIR station. We will define seasonality as "variation of monthly mean values" in the text.

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P4054L27: The occurrence of minimum δ18O values in summer is generally known to be related to snow and glacier melt water run-off (p. 4050L16-18; 4054L9-11). It could be also delayed winter precipitation run-off due to residence time in groundwater but we verified that all those stations are located in catchments with significant snow cover in winter.

P4055L19: The limiting factor in terms of the grid cell size is the RCWIP isoscape resolution (which is 10 arc minutes, roughly translated into ca. 20 km at the equator [and of course less with increasing latitude]) – i.e. the space between 4 grid cell center-points is already 400 km2. We found it fairly misleading to derive predictions from the iscoscape on a number of cells smaller than that; hence the threshold of 500 km2 is certainly arbitrary. We will rephrase this accordingly. As for the HYDRO1K dataset, we don't question its spatial resolution but we found its object attributive granularity (i.e. the subcatchment levels available) quite variant. In any case, the catchments excluded from this analysis were rather small.

P4055L26: The model error is not relative to GNIP but the error includes also analytical errors of GNIP data.

P4057L10: We have no GNIR stations in the SH, which have an alpine or arctic catchment. We expect the same or similar variations.

P4058L3: We want to underline here that the seasonal curve progression of temperature and the isotopic composition are nearly identical.

P4058L4: We refer here to a generally well known average temperature curve in the discussed latitudes.

P4058L10: Yes, we meant here "by comparison" (see 4057L26)

P4060L10: We mean here that the sinusoidal curve, calculated on existing data from several rivers of similar latitudes, can help to predict or verify the seasonal variation (e.g. approximate timing of minimum and maximum δ18O values; magnitude) in any river of similar latitude or topography.

P4060L20: We will rephrase to: “A δ18O vs. δ2H diagram comparing GNIP data (mean and amount-weighted isotopic values) and GNIR samples (not averaged or discharge weighted) showed. . .”

P4060L24: We will calculate and include r2 (correlation of latitude vs. amplitude) for GNIP and GNIR

P4061L11: We agree that in principle it would be desirable to correlate variations over time in the isotopic composition of precipitation and rivers. However, this approach demands spatially and temporally coherent GNIP and GNIR datasets; a known generic issue of past isotopic data records. For this reason we chose a rather simplified approach, last but not least to outline this deficit.

P4071F1: (see answer for general comment and comment 2)

P4072F2: We show a range not a number. Measurement is not correct, as one sample could be measured several times. We suggest rephrasing to “sample per site”.

P4073F3: We have not evaluated sinusoidal functions for GNIP as this has been evaluated in detail by others (e.g. Feng et al., 2009).

P4077F7 and P4078F8: We use the same symbol for GNIP (grey cross) in Fig 4 and 7. We used a different symbol for GNIR in Fig. 6 and 7 to better point out the results. Fig. 8 we plot a new correlation not addressed before. However we will assess whether the reviewer’s suggestions enhance clarity for Fig. 7.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 12, 4047, 2015.